

### **REMARKS/ARGUMENTS**

Claims 1, 3, 14 and 18 remain in this application. Claims 2, 4-13, 15-17 and 19-22 have been canceled. Claims 1, 3, 14 and 18 are currently amended.

Responsive to matters raised in paragraph 3 of the Office Action regarding claims 1, 2, 6 and 11; claims 2, 6 and 11 have been canceled. Claim 1 has been amended to point out and distinctly claim the subject matter of the invention.

Responsive to matters raised in paragraph 4 of the Office Action regarding claims 1, 2, 6 and 14; claims 2 and 6 have been canceled. Although the notion of using the invention as a means for the interconnection of circuit boards is discussed in detail in the specification, we cancel claims 2 and 6 because they fail to particularly point out and distinctly claim the subject matter of the present invention.

Since claims 1, 2 and 6 had become meaningless with respect to our intention of providing a full mesh optical backplane by having removed all reference to the (well known) full mesh equation, we amend claim 1 so that the terms "optical backplane", "dedicated" and "full mesh" can be found together. This new claim is similar to claim 14 but it includes the terms "full mesh" and "dedicated" which have sufficient antecedent in paragraph 7 of the specification (The present invention provides a full mesh optical interconnect in which each circuit board assembly is assigned a dedicated optical transmission path to every other circuit board assembly in a communications system) and also paragraph 9 of the specification (Circuit board assemblies in a system are connected to the backplane in such manner that each circuit board receives power from metallic conductors, and communicates through dedicated optical transmission guides with every other circuit board assembly in the system. Full mesh is the operating condition in which each circuit board assembly communicates over dedicated paths with every other circuit board assembly in a system.). Claim 1 distinctly claims the uniqueness of the present invention since the construction of the backplane provides a plurality of plates of side-by-side optically isolated transmitting and receiving waveguide paths passing through each plate. The backplane provides the means by which each circuit board assembly communicates with every other circuit board assembly in the system by way of a full mesh of dedicated optically isolated transmitting and receiving waveguide paths.

Claim 14 remains in this application. Claim 14 distinctly claims the uniqueness of the present invention:

- The invention is a backplane for an electronics system.
- The backplane comprises a plurality of waveguide plates arranged in a stack.
- The backplane is intended to support a plurality of circuit board assemblies mounted at spaced stations.
- The backplane provides power distribution means for each circuit board assembly.
- The construction of the backplane provides a plurality of plates of side-by-side optically isolated transmitting and receiving waveguide paths passing through each plate.

The waveguide paths in each of the plates are optically accessible at spaced pairs of adjacent optically isolated receiving and transmitting ports at the stations on the plate available for each circuit board.

- Each supported circuit board has a plurality of electro-optical interfaces in optical registry with transmit and receive waveguide paths.
- The backplane provides the means by which each circuit board assembly communicates with every other circuit board assembly in the system.

Responsive to matters raised in paragraph 6 of the Office Action regarding claims 1, 2, 6, 11, 14 and 18; claims 2, 6 and 11 have been cancelled. Claims 1, 14 and 18 remain in this application and claims 1, 14 and 18 are amended in this application.

The examiner argues that Hirota has anticipated claims 14 and 18 of the present invention but the Hirota invention is intended to propagate signals in parallel as do electrical bus structures. Hirota clearly describes his optical transmission layers 11 as being intentionally diffusive in nature beginning in column 4, line 6. The Hirota transmission layers 11 are indeed isolated from each other by isolation layer 12 but there is no isolation *within* a given layer. Further, the transmission layers 11 of Hirota are clearly intended to be bidirectional since the light-receiving/emitting devices 23 align as a pair with a given transmission layer 11; clearly, these plates do not have a plurality of optically isolated transmitting and receiving waveguide paths. Indeed, the diffusive nature of the transmission layers 11 is necessary to provide a means to broadcast the signal originating at a given circuit board to all other circuit boards observing the same transmission layer 11. In fact, the word "waveguide" does not even appear in the Hirota specification or claims. Regarding optical registry, Hirota only describes optical registration to the plates along one axis in column 5, line 32 since he uses slab waveguides, not individual pairs of waveguides. Hirota further describes the shared nature of his signal transmission bus 10 in column 4, line 56. We see nothing in the Hirota invention that anticipates or even suggests optically isolated pairs of optically isolated paths and we question whether it is possible that the examiner has mistaken the Hirota electrical connection terminals 12a in Hirota Figure 1 for pairs of optical paths since they have a superficial similarity to the optical waveguide pairs in the present invention.

Our Claim 18 additionally describes a specific implementation of a waveguide plate that provides optical isolation of optically isolated side-by-side pair paths in an extension of the backplane directly onto the circuit board assembly. Hirota clearly describes the conversion of the backplane optical signals into electrical signals at the light-receiving/transmitting devices 23 and these are immediately adjacent to the transmission layers 11. Hirota does not anticipate the function of a direct extension of the backplane optical paths to the circuit board.

Responsive to matters raised in paragraph 8 of the Office Action regarding claim 3. Claim 3 remains in this application. The examiner argues that Hirota has anticipated claim 3 of the present invention. If the Hirota invention were to have made provision for a stack of plates containing enough optically isolated pairs of optically isolated transmitting and receiving paths to form a full mesh of dedicated point-to-point optical connections on his plates, then Hirota might have anticipated claim 3 of the present invention. However, Hirota has claimed only a set of diffuse waveguide plates of the slab variety. We argue that where a circular slab of diffuse material is an obvious improvement with respect to the Hirota invention, a circular waveguide plate containing optically isolated transmitting and receiving waveguides is not obvious with respect to the Hirota invention since Hirota has not shown how to construct a waveguide plate with even a single pair of optically isolated transmitting and receiving paths. In fact, the word "waveguide" does not even appear in the Hirota specification or claims.

Responsive to matters raised in paragraph 9 regarding the Kim invention, even though the examiner has not relied upon it, we will address the Kim invention. The Kim invention provides for the rebroadcast of a received signal from one component (circuit board 84a, 84b, 84d or 84e) to all other components (circuit boards) by means of a distributor component (circuit board 84c) located in the approximate center of the Kim backplane. The Kim invention is far removed from the present invention since it has shared optical paths (not fault tolerant) and since it requires the use of the distributor component to forward all messages from the transmitting waveguide to the receiving waveguide (not fault tolerant in the extreme).

Responsive to matters raised in paragraph 10 regarding our arguments with respect to Popoff and now particularly related to our claims 1, 3, 14 and 18. We thank the examiner for considering our arguments and suggest that many of those same arguments are valid with respect to the Hirota invention since the Hirota invention is a broadcast backplane invention very similar to Popoff. Popoff used a stack of star couplers (optically separated from each other by total internal reflection in the star couplers) to share a parallel group of optical transmission paths between multiple circuit boards as well as multiple transmitters and receivers on said circuit boards and Hirota used a stack of diffusive slab waveguides (optically separated from each other by isolation layers) to share a parallel group of optical transmission paths between multiple circuit boards as well as multiple transmitters and receivers on said circuit boards. In both cases, there is sharing of a parallel group of optical transmission paths between multiple circuit boards and there is no isolation *within* a given star coupler (Popoff) or slab waveguide (Hirota).

### ***Summary***

Neither Popoff or Hirota (or for that matter, even the prior art made of record and not relied upon; Alferness and Kim) anticipates the present Full Mesh Optical Backplane invention whereby each circuit board assembly communicates with every other circuit board assembly in the system by way of a full mesh of dedicated, side-by-side optically isolated transmitting and receiving waveguide paths passing through a plurality of waveguide plates arranged in a stack. We are hopeful that the Hirota electrical connection terminals 12a have not been mistaken by the examiner for dedicated, side-by-side optically isolated transmitting and receiving waveguide paths passing through a plurality of waveguide plates arranged in a stack, when in fact the word waveguide does not even appear in the Hirota specification or claims. We have provided sufficient antecedent to amend claim 1 so that the terms "optical backplane", "dedicated" and "full mesh" can be found together in the claims of the present invention. Although the concept of a full mesh is well understood by those skilled in the art, nonetheless the present invention provides a definition in paragraph 9 of the specification: "Full mesh is the operating condition in which each circuit board assembly communicates over dedicated paths with every other circuit board assembly in a system."


The present invention is unique relative to the prior art cited by the Examiner based on the following observations that would be apparent to those skilled in the art:

1. The present invention uses the term "full mesh" in the title of the invention, in the abstract, throughout the specification, in the objects of the invention, in the illustrations and also in the claims of the present invention. The cited prior art does not describe a full mesh, in fact the term "full mesh" is never used anywhere in any of the cited prior art.
2. The cited prior art does not describe, or make use of dedicated, optically isolated waveguide paths. Every one of the prior art inventions cited by the examiner describes and makes use of shared paths.
3. The word "waveguide" is used throughout the present invention to describe the transmission paths. The word "waveguide" does not even appear in the Hirota specification or claims cited by the examiner.
4. The prior art cited by the Examiner does not anticipate the present Full Mesh Optical Backplane invention whereby each circuit board assembly communicates with every other circuit board assembly in the system by way of a full mesh of dedicated, side-by-side optically isolated transmitting and receiving waveguide paths passing through a plurality of waveguide plates arranged in a stack.

In the event the Examiner persists in any of the rejections, it is respectfully requested that the Examiner telephone the undersigned applicant in order to discuss the application and to expedite prosecution thereof.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted



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